

ART. XI.—*Extracts from Diary in Japan.*

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[Read 13th September, 1877.]

JAPAN consists of four Islands, governed by an Emperor, Ministry, and Parliament.

The Ministry consists of Premier, Ministers of Finance, Foreign Affairs, Public Works, Education, Agriculture, &c., &c., with Vice-Ministers to each department.

Its members of Parliament are not elected by the people, but are the Chief Magistrates of the various kens, or districts, and are supposed to know the requirements of their people.

Yesso, the northern island, is about the 44th degree of latitude and under the 144th parallel of longitude. Here the winter is extremely severe; with almost constant snow during the winter months; the bear, wolf, deer, wild boar, otter, fox, hare, &c., are abundant; ptarmigan (grouse), woodcock, snipe, &c.; codfish, herring, salmon, in profusion. The cod, salmon, and roe of fish are salted and sent to the southern towns in hundreds of tons per annum, and form with rice the chief food, meat being little eaten.

Nippon, the main island, has the largest population; Yedo, the capital, contains 3,000,000 inhabitants.

The southern islands produce the best rice, and the largest amount of good coal and minerals, excepting gold, which is found principally in the north. Silk is produced in Nippon and the southern islands; a large amount of good rice is also grown around Yedo and Yokohama and southward.

The temperature at Yedo during the hottest days in the sun was 122°, in the shade 93°; and the coldest 25°. It is believed that the thermometer often shows 14° of frost, 18° Fahr.

The autumn and winter months, from October to April, are very dry and bracing, with clear bright atmosphere, and from April to October very wet; the chief amount of rain falling during the latter months. The rainfall at Yedo, as obtained from Observatory, is 72 inches. The atmosphere during the summer is excessively humid, and very dry in winter. Furniture contracts and breaks its joints in winter; whilst in a summer's day one's boots become mouldy, and

kid gloves spotted, which it is absolutely impossible to prevent.

Strange as it may appear there is very little sickness in summer, and fevers are almost unknown.

Small-pox is very prevalent in winter, and appears when the cold sets in, disappearing with the spring rains.

Skating is fashionable amongst the European population of Yokohama; good ice usually lasts a month, or six weeks; it is necessary to shade it with mats, or the sun's rays thaw it.

The 10th of January, 1876, eight inches of snow fell at Yedo, and remained with frost six days, and began to thaw the seventh day. On 27th January, 1876, fifteen inches of snow fell at Yedo, and delayed trains; in some places it was four feet deep.

July, August, and September are very hot months; although the temperature is much less than in this colony, the heat is more oppressive. Sun hats (helmets) and white linen clothes are worn.

There is very little thunder and lightning, but severe earthquakes, which appear to travel east to west; eastward is Brise Island, which has upon it an active volcano, and Fujiyama, the holy mountain, nearly 14,000 feet high, is distant about sixty miles west from Brise Island. Yedo and Yokohama, which are eighteen miles apart, lie between these two mountains; and it is thought the waves or shocks travel from Brise Island to old Fuji. (See notes on earthquakes at end.) Fujiyama is clothed with snow about nine months of the year, and is ascended by hosts of pilgrims during July and August, who are stamped on the back with a large circular seal, or stamp of red paint, in proof of the ascent being made; the pilgrims are usually clothed in white loose tunics and trousers, straw sandals, and huge broad brim hats, made of flat rush or bamboo. Fujiyama is well wooded at the lower part, but barren towards the top, which consists of loose lava and ashes, with a deep inactive volcano basin at the summit.

The ordinary lilac rhododendron grows on the mountain. According to tradition Fujiyama rose from the plains in a day, or night; the day being a dark day of horror and destruction by earthquakes, &c. The superstitious believe that the earth is moved by a huge tortoise.

Japan generally is mountainous, a chain of mountains running from north to south, through Nippon, of 3000 to

10,000 feet altitude. It is watered by numerous rivers from these mountains, emptying into the sea. The rivers are some of them wide near the sea, but narrow and more rapid inland; they abound with trout and salmon—the salmon being local, that is northward, although the salmon trout, a delicate fish with pink flesh, is largely taken in Lake Biwa, near Kobe (southward). The lakes are numerous and extensive. The country near the coast is beautifully wooded with small groves of evergreen and deciduous trees. The features of this portion of the country are striking, the hills running out towards the coast in forms resembling barrows, very steep, with irrigated valleys between—each valley having its stream, or rivulet; the tops and sides of the hills being clothed with trees and bamboo groves, and dotted with farms. The woods are lovely, tinted with every shade of colour in vegetation; the deep green of the cryptomeria and pine, evergreen oaks and other trees, intermixed with golden feathery bamboos, the scarlet, blood-red, and pink maples, the light green of the deciduous oaks, ash, beech, birch, elm, horse and edible chesnuts, &c.—the latter being a common forest tree.

The cottages are frequently sheltered by a bamboo grove (the bamboo attaining a height of 60 feet), and have a garden, with plum trees, and lime trees 20 feet high, with their golden fruit and deep green foliage; persimom of light green foliage and chrome-coloured fruit, resembling golden eggs.

The parks are lovely, especially Uyeno and the Castle gardens, with its ornamental water and rocky cascades; particularly when the double-blossom cherry and peach are in flower. The cherries grow 50 feet high, and the pines, cryptomeria japonica, cephalotaxus, &c., to 80 feet, casting a deep shade. In many districts avenues of cherries are planted, and thousands of Japanese go to see them in blossom; it is one of the great holiday sights. Among the early blossoming trees are the wisterias, purple, lilac, and white; there is also a double blossom purple. The wistaria, or fuji, is one of the greatest favourites, some of them being over 100 years old. The stem is carried up straight and the branches trained overhead on horizontal bamboo trellis, with seats underneath; one tree will often cover a square of 50 x 50 feet. They are generally planted at the tea houses, for shady lounges; the tresses of blossom hang through the trellis overhead. In the woods the wistaria is everywhere to be seen, with its beauti-

ful lilac tresses of blossom hanging in festoons from the branches of the forest trees; here the ivy clothes others, the old English mistletoe hangs from the boughs above, and the honeysuckle wreaths the underwood. Neat hedges divide the cottage gardens, and frequently enclose the gardens of the rich. A wild bitter orange is the best hedge plant, as it is impenetrable; but the *euonymus japonicus*, *althea* (*hibiscus*), with white and lilac blossom, and the *cryptomeria* are used; these all make neat hedges when well kept. The *camellia*, although wild, is usually planted along the roadside; it frequently attains a height of thirty feet, profusely studded with lovely red blossoms. The fan palm is also a favourite, and produces a beautiful effect; the hairy covering around the stem is used in lime plaster of dwellings. The pink and white *daphne* attain a height of five feet, as also the *azalia*, which grows wild, and is cultivated in every variety of colour in the temple grounds and gardens, as also the lovely *olea fragrans*, or Japanese *mignonette*, so called from its powerful and sweet scent; together with the charming *lagerstroemia rosea*, a tree 20 feet high, covered with magenta blossoms. The umbrella pine (*sciadopetys verticillata*) adorns the temple grounds, as also a tree resembling *araucaria bidwillii*, excepting that it grows very straight, tall, and luxuriant, with light green foliage, said to be a *cunninghamia*. The grandest of all trees, and perhaps the most esteemed, is the *ginko biloba*, or *salisburia adiantifolia*, which attains a height of 80 to 100 feet, with a noble contour, the foliage pale green in summer and chrome yellow in autumn. The commonest of all trees, and one of the most stately, is the pine of the country, used for firewood and a variety of purposes (*pinus massoniana*); this tree is the common tree of the forest, the roadside, and the avenue, and is most frequently pictured in lacquer work and introduced in bronzes, &c. The berry-bearing shrubs are much admired and cultivated; the most prominent is the bamboo of heaven (*nandina domestica*), with its light feathery foliage and lovely scarlet or yellow wax-like berries; it is to be seen in almost every temple ground and cottager's garden, and decorates the houses at Christmas time.

The timber generally used is the *cryptomeria japonica*, scented and soft like cedar (*sugi*), for lining houses, doors, windows, and boxes. An *ulmus* or elm (*planera japonica*), for temples, outdoor work, and furniture, is the most used

and most valued of all. *Cupressus obtusa* (*hinoki*) is much esteemed for its durability, closeness of grain, silky appearance, and freedom in working; it is used for all the best temple fittings, &c.

The timber most commonly used in the rough framing and roofs of houses is the *matz* (*pinus massoniana*). There are seven species of oak, three evergreen and four deciduous. The deciduous oaks are seldom allowed to attain large growth, but are cut young for charcoal, oars of boats, &c. The evergreen oaks are large trees and truly magnificent; one, the *kashi* (*quercus glauca*), has immense glossy leaves, and is used for planes and other carpenters' tools, being very hard and of close grain. The ash (*fraxinus excelsior*) is fine timber, but seldom utilised, being chiefly burned for charcoal; the wood is like the European ash, as also the foliage, but is more robust. The walnut is largely grown, although the timber is not utilised.

The houses generally are built of timber, with heavy timber roof, tiled, frequently of two stories; the peculiarity is that all the windows and doors slide in grooves, economising space; the windows are framed in small squares and covered with paper, with a sliding shutter outside, which is closed in wet and stormy weather. The houses are without fireplaces, but are warmed by *hibachis*, an earthenware or bronze vessel containing lighted charcoal; the houses are scrupulously clean, the floors generally matted with rush matting. The higher class houses are heavily framed, diagonally lathed outside, and faced with flat tiles, which are nailed on vertically and the joints seamed with lime mortar; these houses are dry, cool, and comfortable.

The cities and towns are all much alike, with narrow streets, unpaved, but frequently macadamised. Lately, brick houses and wide streets have been adopted in Yedo and Yokohama by advice of Europeans, and they are much approved. The streets of Yokohama are wide and altogether of European appearance—this town having been chiefly occupied by Europeans and Americans for a considerable period. Yedo has now also given way to the same innovation; and Ginza—the main street leading from the railway station to Nihom Bashi (one of the chief bridges)—has omnibusses continually running, and hundreds of horse-drawn vehicles, also thousands of *Jinrikishas*—a small, hooded vehicle, on two wheels three feet in diameter, with springs,

cushioned for one person; it has shafts, between which a man runs; when two men are employed, the foremost draws by a rope; two men will run from twenty to thirty miles, the greater part of the distance from eight to ten miles per hour. Yedo and Yokohama are lighted by gas, superintended by a French engineer. Yedo is a fine city, with a magnificent river, and veined with canals—nearly all navigable for large craft. The Harbour Trust of Melbourne might benefit by a trip to Yedo, which would make them less sceptical of the certainty of making a canal from the Gasworks to Hobson's Bay—a paltry  $1\frac{1}{2}$  miles, whilst in Yedo and other towns of Japan there are hundreds of miles of navigable canals, nearly all opening into the sea, and walled from end to end with masonry.

The masonry is wonderful as it is beautiful; it is generally of parabolic outline, with a quick curve at the base, and becoming nearly vertical at the top, with an average batter of about 1 in 12. The masonry is all of dry, squared rubble, coursed; the walls of the moats round the castles attaining a height of from 50 to 100 ft. Some of the stones in Osaka Castle weigh by measurement 160 tons each. The castle is on a hill, probably between 100 and 200 feet above the surrounding country, encircled by swampy rice-fields, four miles across before any quarry is reached; therefore the presence of such enormous stones on an eminence so far away from any quarry is a marvel which no Japanese could explain. The only answer was that the castle had been built about 500 years, and no records kept.

The temples of Japan are truly superb. The decoration of the interior is lovely and chaste; the intermixture of colours, opposed to each other according to European taste, are so beautifully blended and subdued that the most sublime harmony exists, and there is only one feeling of all visitors—the marvellously lovely and glorious effect.

The exterior of the temples is majestic and grand, built generally upon round wooden columns of large diameter, stepped into blocks of stone, with immense overhanging roof, heavily tiled, beautifully neat in pattern; the roof hipped but externally concave in the line of rafter; the overhang, supported by rafter upon rafter protruding in succession, beautifully carved, adding to the massive grandeur. There is usually an entrance gateway, roofed with the same massiveness and beauty, with noble gates,

hung by enormous wrought-iron strap hinges, and bound in every direction by copper, bronze, and iron. A long, paved causeway, lighted on each side by grotesque columnar stone lanterns, beautifully carved, leads to the temple. Spacious grounds of many acres surround the temple, planted with beautiful forest and flowering trees and shrubs. As a rule, the grounds, which are enclosed by walls, are most lovely. A flight of stone steps leads to the temple entrance, which is closed by massive doors. The temples are usually guarded at the entrance gates or at the temple by huge human figures, carved in wood, painted red or black, complete and lifelike; the expression of the features most effective.

The interior of the temple is superb; black polished lacquer floor, with gilt surroundings; the altar a miniature temple of emblazoned gilt; the deity of gilt with the halo around the head, reminding one of the Roman Cathedral. The whole of the ceilings of the temple are panelled and painted in gold, green, purple, scarlet, and black, in the most chaste and elegant patterns, so minute that the decoration must have occupied a lifetime to execute. The priests officiate, and the suppliants kneel with their hands raised and clasped in the form of Christian prayer, chanting the service and counting their beads; a font of holy or sweet water stands at the temple entrance.

The priests, with their heads shaven mostly, are jolly fellows, glad to show and explain everything. Outside, slung on a large wooden beam, is an enormous bell of bronze, many tons weight, beautifully embossed with various devices, and tolled by a huge battering-ram of timber drawn backwards and forwards by ropes.

There are two contending religions—Buddhism and Shintoism. Shintoism is the approved religion of the Government; both are ceremonially similar to the Christian religion, the creed being much the same: they each believe that God has been on earth to reform and save them.

The colossal figures in bronze of their god Daibutz are very wonderful, being from forty to fifty feet stature, beautifully finished and polished outside, and the features most expressive and lifelike. The whole figure is composed of bronze, cast in small segmental plates, about one inch thick, and brazed together.

The soil is generally volcanic, rich and dark chocolate, overlying in many districts a clay slate much similar to that

of Melbourne. The Kobe district, 300 miles southward from Yokohama, is granitic, and there the soil is poor, composed of coarse grit sand.

Kobe is one of the chief open ports, and communicates by railway with Osaka, distant twenty miles, and Osaka with Kioto, distant another twenty miles, or forty miles of railway from Kobe.

Kioto is the ancient city of the Mikado, and the people of Kioto wish to regain the seat of Government from Yedo, where it now is.

It was intended to extend the railway from Kioto to Yedo—*i.e.*, connect the two, *viz.*, the railway between Yokohama and Yedo, eighteen and a quarter miles, with the Kobe line—which would require three hundred miles additional line; but for the present this is abandoned.

Again referring to the nature of the country, there is a total absence of chalk, limestone only of various kinds having been found.

The minerals generally are copper (widely distributed), iron, lead, silver, zinc, and gold; gold deposits do not appear to be rich. Coal is also widely distributed, of excellent quality, and varying from very bituminous to hard, approaching the character of Welsh or anthracite. The price delivered in Yedo or Yokohama is 8 dols. (32s.) per ton. It is not more than 10s. per ton at the mines in the Southern Island.

The mining is controlled by a department with a large European staff; but it does not appear to pay, and the Japanese prefer mining in the old manner.

There are several colleges in Yedo; the principal one—the Imperial College—is a most splendid institution, with a number of excellent English professors. It is established as an engineering college, and has extensive engineering workshops, capable of manufacturing the largest marine engines, being equipped with the finest machinery. There are professors of engineering, natural philosophy, geology, chemistry, electricity, English, mathematics, surveying, and all branches of education. Attached is an extensive museum of models, &c.

Yedo is the principal city of Japan, and the seat of government, and where the Emperor resides. There are two parks—Uyeno and the Castle—and several lovely palace gardens, the resort occasionally of the Emperor. Uyeno Park pro-



bably is not excelled in beauty, grandeur, and variety of trees by any park in the world.

Near Yedo is the Katakushi, or experimental farm, and Horticultural Gardens, which hitherto have been presided over by Americans. The whole affair has been very costly, with very poor result.

The military organisation is principally at Yedo; the cavalry, infantry, and artillery and arsenal, are under the supervision of Colonel Munier and staff, who are sent out by the French Government at the request of the Japanese Government. The Naval Department is organised by English officers, selected by the English Government.

Japan has about one hundred thousand troops, well armed with the best breech-loading firearms, and artillery, and all well clothed in smart European costumes. The greatest credit is due to the French officers. Many of the Japanese officers appear to be as smart as their European instructors; and when in their gold lace or red uniform, &c., it is difficult to distinguish one from the other.

Throughout Japan there is an immense and most efficient police force, entirely controlled by Japanese officers.

The European banks are the Oriental, the London Chartered, the Shanghae, Comptoir d' Escmpt, and German bank. These are all at Yokohama; Mitsuës, the Government bank, is alone at Yedo. The currency is the silver Mexican dollar and the Japanese gold yen, of about equal value, of 4s.

All the Legations are at Yedo, the British and Russian being the most imposing; these two having erected fine buildings on large commanding sites. The Italian and German are in proximity, but the French still remains between Yedo and Shinagawa, where the English Legation originally was, outside Yedo.

The Legations are all presided over by ministers, who have been especially well chosen by their respective nations; under the ministers are consuls and vice-consuls. Yedo is the great centre of commerce. The exports—which are silk, tea, china (porcelain), tobacco, rice, copper, and various articles, chiefly fancy goods—nearly all pass through Yedo to Yokohama by water or rail, except those which are shipped from other open ports; all open ports have a customs department.

The revenue of Japan, as published by the Japanese Treasurer, is £17,000,000 sterling, chiefly raised by a land

or produce tax, and an import and export duty of 5 per cent.; also a multiplicity of small taxes levied upon their own people.

The people are a most distinct race, all having black hair, and black eyes slightly almond-shape, which is most observable in the ladies of high birth; in this there is a remarkable distinction, the ladies of high families possessing characteristic features in the thin aquiline nose, small mouth and lips, and full black eyes, slightly almond shape, remarkably fair, clear wax-like complexions, lovely teeth, and the most beautifully-formed hands and arms. The hair is studied to the last degree, most beautifully arranged and kept, no covering to the head being worn. The dress is elegant and chaste, the all-prevailing purple and scarlet being the favourite colours of the ladies, although many other lovely colours are introduced—always harmoniously.

The outer dress is silk, folded across the chest, leaving the neck bare, closed by a broad obo or sash around the waist, fastened in a large loose knot behind; and generally a scarlet under garment, showing in front below the outer dress. The outer dress is usually embossed or embroidered beautifully with floss silk, in various devices; the feet covered by a white sock, and the sandal or clog worn.

The gentlemen wear a long loose dress of silk in winter, and silk gauze in summer, folded across the chest, leaving the upper portion of the neck exposed; fastened round the waist with a narrow obo, the legs bare, but covered by the outer garment, which reaches the ankle; socks and sandals, or clogs, being worn on the feet; no covering to the head, the hair drawn tightly back from the forehead, gathered and tied at the crown in a short queue brought forward flat upon the head. Two swords were worn until quite lately, being now prohibited by Government. The swords—one long and one short—have curved blades and wooden scabbards, the swords being of the finest steel with the sharpest edge, and much prized according to quality. It is said that a Japanese considers it a disgrace to draw his sword and sheath it without drawing blood, if drawn in anger.

The gentlemen ride on horseback. The horses are cobs, about fourteen hands, and very enduring; the trappings elaborate, large Eastern saddle and cloth, heavy stirrups enclosing the foot, and heavy head mountings, with silk reins, &c., all extensively worked.

The norimon of basket-work, sometimes entirely enclosing the traveller and sometimes open with a handle or rail running along the top (overhead), carried on the shoulders of a man in front and one behind, is the mode of travelling through the interior where the roads are bad.

There are several main roads, each one called a tokaido; moderately well kept, upon which horse vehicles can travel some considerable distance; but the roads generally are mere bridle tracks, unformed and unmade, upon which pack-horses alone can travel. All the produce which cannot be sent by water is brought upon pack-horse, even to timber, and it is astonishing what a quantity of heavy material is so conveyed.

The people are exceedingly polite and obliging in the interior as well as in the coast cities. No foreigner is permitted to travel beyond treaty limits without a permit (passport); the treaty limits are thirty miles around Yokohama, and about the same at other ports.

Japan is divided into provinces and kens, with a Governor to each province and police magistrates in each ken. All travellers on demand have to produce their passports or permits; on refusal, are arrested by the police and escorted back to their place of residence, there to be brought before their consul.

A large variety of poultry is kept, and game is abundant. Fowls average about 9d. each; ducks, 1s.; geese, 3s.; turkeys, 8s.; pheasants, 1s.; woodcock, 1s.; snipe, 3d., &c.

Sheep do not thrive, the country being apparently too wet; all the mutton is imported from China. Cattle of a small size are plentiful, as also pigs. Good beef is 8½d. per lb.; mutton, 1s. 5d.; and pork, 10d. Vegetables are plentiful and cheap. Fish is abundant in considerable variety, very good, and reasonable in price.

The principal fruits are plums, several excellent varieties; the persimon (kaki) eaten fresh and dried like figs in large quantities, and of several varieties, a delicious fruit. Loquats, oranges, cumquats, and a coarse variety of lime. Inferior pears, peaches, and apricots—good small green flesh, and water melons. Inferior grapes; a good variety, but the climate is not sufficiently warm to thoroughly ripen them.

Agriculture is one of the largest industries, and suited to the peculiar features of the country as there prosecuted. The land is all surveyed each year, and the breadth of

produce recorded, and a tax levied on each producer. The high land, where irrigation cannot be applied, is cropped with barley, wheat, millet, buckwheat, pulse, root and green crops, &c. There is a large variety of leguminosæ, especially beans, which form a favourite food. Buckwheat and barley are also largely grown, and used as flour in cakes; the horses are also fed upon steeped barley. Wheat is not largely cultivated.

Rice is the staple food, and the rice fields with the waving rice in ear when green, and also when changing colour, produce a fine effect, the whole valleys appearing as one level sheet of green or golden-yellow when ripe.

The rice is sown in small seed-beds, well worked, manured, and irrigated, on the 1st of May and few following days; the seed is sown broadcast very thickly upon the surface, and about one inch of water remains over the seed. From the end of May until the 5th June the paddy or rice fields are being prepared for the transplanting of the rice from the seed-beds.

The rice fields or plots are from a half to two or three acres in extent, thoroughly level, and surrounded by a bank of earth about 12 or 18 inches high and 12 inches wide on the top. All these plots are levelled by a water-level, a bamboo split in half and placed horizontally upon a vertical stake and filled with water; the bamboo must thus be quite horizontal or the water would run over the ends, where the bamboo staves are sighted. Throughout the fall or decline of the valley these plots are one lower than another, the water being admitted to the highest and passed from one plot to another by openings in the banks surrounding each plot.

These plots are usually dug or rather turned over by a heavy drag fork, which is struck into the soft ground by the husbandman and then pulled towards him, thus effectually turning over the surface of the rice plot to a depth of 12 inches; water is then admitted into the plot, and a horse draws a rake or harrow, which is pressed down from behind by the husbandman or lifted when clogged; a little rice husk or green weeds appear to be the only manure given at this stage. After thoroughly stirring and mixing the soil into mud, the rice plants are taken out in bunches from the seed-bed and transplanted singly by hand in rows or drills about 9 inches apart in the rice plots, and 2 inches of water is run into and

kept over the surface of the plot. The transplanting begins about the 5th of June and ends about the 25th; the rice comes into ear in September, and is reaped in November and December, and laid upon the banks of the plots; afterwards carried to the side of the valley, and the straw drawn through an iron comb fixed upon a trestle. The grain being thus stripped from the straw, is conveyed to the farmer's store. The rice-straw is tied around the stems of the alder and other trees which surround the rice fields, and is used for fodder for horses, &c.

Liquid manure is sometimes applied to the rice, but as a rule the manure used for the previous crops is sufficient. Before the rice is reaped the plots are drained by allowing the water to flow away through the apertures which feed from plot to plot. As soon as the rice is cleared the ground is broken up, and a root crop, or barley, or buckwheat, or some other crop grown which can be removed in time for the next rice-planting. Barley is harvested before the middle of June. These crops are manured by liquid manure poured along the drills from a hand-ladle; this is the most important, as no other manure is used, and yet the same cultivation has gone on for centuries with a constant growth of rice year after year upon the same land. Japan is thus entirely self-supporting. All excreta or fæcal matter is carefully retained in tanks or earthenware jars, which are emptied once or twice a week by the agriculturists, who fetch it in deep wooden buckets and carry it across their shoulders for miles to their farms; it is also taken long distances in these buckets slung across a pack horse; also by barges along the canals. There are in many places municipal large tanks for receiving it, ready for water carriage.

The application to the plant is very important. It is carried to the farm, there stored in an open tank preserved from the rain by a thatched roof, but exposed to the atmosphere; fermentation at once takes place, the gases pass away, and it is then poured along the drills by the side of the growing crop and frequently upon it, which it does not injure, probably because fermentation in the atmosphere has taken place.

It is estimated that the excreta from eight adults keep an acre in the highest cultivation, producing at the rate per diem of one pound of grain or pulse and one and a half pounds of green vegetable. This with a little fish and eggs

forms the food of the Japanese. In other words, it is estimated that eight adults live from the produce of one acre, and keep it in heart as above stated. To go minutely into this subject would make the paper too long, but it has been carefully calculated. In England the excreta from 800 to 1200 persons is used per acre without profitable result, as stated this session at the Institute of Civil Engineers of London.

The rice grain is husked or shelled in wooden mortars by a concave wooden pestle, a number of which are worked by a wooden shaft, fitted with wooden pegs forming cams, the shaft being driven by a waterwheel constructed entirely of wood. Stone-husked rice is not liked, the wooden pestles producing a high polish upon the kernel.

Many species of roots are eaten; the sweet potato (*dioscorea batatas*) most largely, and is very delicious when properly cooked. There are also two species of roots, one grown on dry ground and one in the rice fields; each of these have leaves like the arrow head or arum (*calla*); all these three, as well as the ordinary potato, are called imo.

The beautiful lotus (with its lovely, large, lily-like white or pink blossoms, and large deep green leaves, floating upon the water or waving in the wind) is considered a great delicacy. The root is boiled or steamed, and has a slightly sweet but most agreeable flavour.

Of the root crops grown on dry ground the giant radish (*daicon*) has the largest consumption, perhaps; it is eaten in every way—boiled fresh, dried and boiled, &c. It is coarse in flavour, in size it is about 24 inches long by 2 inches diameter. Carrots and leeks are largely grown; onions and turnips sparsely. The whole country is irrigated where possible; the irrigation is simple, perfect, and inexpensive.

The white mulberry is cultivated to a large extent, but chiefly in small patches by farmers whose families raise silkworms; a large amount of silk is produced from *bombyx mori* by cottagers. The *bombyx* of the oak (the *yamamai*) also produces a considerable quantity of coarse silk; in a wild state a silk is likewise obtained from the *bombyx* (which feeds upon the *ailanthus* as well as the oak), the cocoon of which is open like network. The silk is chiefly reeled by hand, but one establishment in Yedo reels by water-power.

The woven silks have not been equal to those of foreign

production, and the Government have imported filateurs from France to improve the silk manufacture.

Paper-making is one of the arts developed to the greatest extent. The paper is said to be manufactured by cottagers and farmers from the bark of the mulberry (the inner bark being separated from the outer), macerated by boiling, and pounded into a pulp with rice-water and spread out in thin layers; the outer bark being made into a coarse paper. Several European paper-mills have been erected where the paper is made from rags, &c.; these mills produce good white paper. The Japanese paper is of yellow cast, but is extremely tough, and is used for waterproof coats, windows, umbrellas (parapluis), tobacco pouches, and a variety of other purposes, and last, not least, for pocket-handkerchiefs.

Very many of the birds are identical with those of Europe. The sparrow is seen everywhere in large quantities; and although *pyrgita montana*, the tree sparrow of Europe, it breeds almost entirely in houses, and has exactly the habit of the London sparrow; but the plumage of the female is similar to that of the male.

The hawfinch (*cocco thraustes vulgaris*), bullfinch (*loxia pyrrhula*), crossbill (*loxia curvirostra*), bramblefinch (*fringilla montifringilla*), redpole (*Lynota linaria*), siskin (*carduelis spinus*), greenfinch (*cocco thraustes chloris*), house swallow (which migrates, appearing again on 5th April), skylark, pipplet-lark, long-tail titmouse, large tomtit, small tomtit, wren, golden-crested wren, jay, waxwing, nuthatch, &c., are the same as those of Europe, with English song and call—that is, the song and call are exactly similar to those of the same species in England. There are numerous others, such as the linnet, which differ from the European species, and very many which are not found in Europe. The birds of prey are, many of them, identical with those of Europe.

The reptiles appear to differ from those of Europe. There are several species of snakes which are very abundant, many of them frequenting the trees; all are harmless excepting the marmouchi, which closely resembles the adder of England.

The most wonderful reptile is the *Sieboldia maxima*, a large animal about four feet in length, very robust, and nearly black, with four legs and flattened tail, resembling in character the water eft or newt; it is found in the rivers, and is harmless. Baron Siebold had a fine live specimen,

which required two persons to lift it from its bath; it appeared to be sluggish in its movements.

The insects are perhaps the most interesting to the naturalist, especially the Lepidoptera, as so many are identical with those of Europe. Referring to a few of the papilionidæ, or butterflies, the following are identical with those of England:—*Papilio machaon*, *peris rapæ*, *peris napi*, *leptoria candida*, *gonepteryx rhamni*, *colias hyale*, *argynnis paphia*, *argynnis aglaia*, *argynnis adippe*, *vanessa io*, *vanessa antiopa*, *vanessa polychloros*, *vanessa cardui*, *limenitis sybilla*, *lycœna phlœas*, *polyommatus argiolus*. These are English species, but the butterflies generally in Japan are very numerous and lovely.

The following are some of the moths identical with those of England:—*Smerinthus ocellatus*, *acherontia atropos* (considered a different species in England, and named *acherontia styx*, but the larvæ and imago appear to be identical), *sphinx convolvuli*, *chœrocampa elpœnor*, *macroglossa stellatarum*, *clisiocampa neustria*; *dendrolimus pini* is abundant, but whether identical is doubtful; *gastropacha quercifolia*, *stanropus fagi*, *clostera curtulæ*, *cerura furcula*, *chrysa binula*, *porthesia dispar*, *psilura monacha*, *porthesia chryssorrhœa*, *porthesia auriflua*, *spilosoma menthastri*, *spilosoma lubricepeda*, *spilosoma urticæ*, *spilosoma salicis*, *arctia caja*, *enthemonia rusula*, *miltochrysta miniata*, *lithosia complana*, *lithosia quadra*.

#### NOCTUIDÆ.

Several of *lytœa*, or rustics, as also most of the *agrotis*; *segetum*, and others; many of the *graphiphora*, *orthosia*, *mythimna*, *segetia*, *caradrina*, *grammesia*, *glæa*, *amphipyra*, *lemuris*, *calocampa*, *xylophasia*, *hadena*, *euplexia*, *mamestria*, *Thyatira*, *scoliopteryx*, *acronycta*, *ceratopacha*, *cosmia*; most of the *xanthia*, *orbona*, and *gortyna*, *phlogophora*, *cuculia*, *plusia*, *heliothis*, *ophiusa*, *mormo*, and *catocala*.

To go through the thin body moths would occupy too much time; but the larger number of English species are found in Japan.

In enumerating the above it must be understood that the numerous species omitted because not identical with those of England are far more beautiful than those mentioned. The *papilio*, or swallow-tail butterflies; the *apatura*, or Emperor; the *thecla*, or hair-streak; the *parnassus*, or Apollo, &c., are very grand. Also the large family of



sphingidæ, particularly the clear wings or sesia, which are magnificent; and the species of catocala are lovely beyond description.

The humble bees are numerous; several species identical with those of England. Also the hornet, which is abundant; of this there are two or three species, one identical. The wasps differ; all have their nests on trees or some other dry place, the ground being too wet. It is curious to see the nests in rose bushes, &c., slung from a bough; and although they are very numerous in species and in quantity they are not troublesome. The coleoptera are very fine, with many new species.

In referring particularly to the very many species identical with those of England it is remarkable, because Japan consists of a series of islands so very distant and isolated from England, and goes far to disprove Darwin's theory that the farther species are from species—that is, the more they are diffused by distance—the more they must differ, having to struggle for existence over so great a space.

This paper must be received as a series of notes, not as a carefully written paper, as it has been written hurriedly; but it is hoped that there will be some matter which may prove interesting, as the whole may be relied upon as facts gathered by actual observation, although even then slight errors creep in.

F. C. CHRISTY.

5th September, 1877.

#### EARTHQUAKES OBSERVED BETWEEN THE 1ST JANUARY AND 17TH OCTOBER, 1876.

January 20th, 8.40 p.m.—Very severe vertical shocks; threw the wine out of champagne glasses, which were only half full; commenced by slight shock, immediately followed by severe shock, which lasted about three seconds, unaccompanied by noise; fine calm night, rained next day.

January 29th, 4 a.m.—Severe oscillating shocks; snowing all day, 15 inches deep on ground.

January 11th, 5.40 p.m.—Two very severe shocks, one immediately after the other. Whilst walking on the grass plot in front of dwelling the earth undulated from 1 to 3 inches; the trees rose and rocked as the wave rolled along; the wave appeared to travel from west to east. Second shock very severe, oscillating and trembling motion, causing

the house to shake as though the tiles and windows would be thrown out of their places; no noise, excepting from the shaking of the house, which was so alarming that it was thought advisable to keep at a distance from it. The house is large, two story, heavily framed in timber, faced and roofed with tiles; the evening lovely and calm, with clear sky. First shock lasted 2 to 3 seconds, 2 to 3 seconds interval, then second shock lasting 3 to 4 seconds. During the day, which was unusually warm, a depressing sensation was observed.

February 13.—Three shocks during night; snowed all day.

February 26th, about 9 p.m.—Slight shock; day fine and warm.

March 9th, 12.10 (noon).—Sharp shock.

March 13th, at night, 12.20 a.m.—Moderate shock; gale sprung up, which lasted from 2 a.m. till 11 a.m., with rain; night very warm.

March 31st, 7.40 p.m.—Long, but not severe oscillating shock, apparently from west to east; lasted several seconds; weather calm.

April 11th, 2.25 a.m.—Slight shock; two seconds after, a severe shock. 4 a.m.—Slight shock.

April 12th, 7.10 a.m.—Severe shock.

April 17th, 6.30 p.m.—Sharp shock; day very fine.

April 21st, 5.30 a.m.—Slight shock.

April 25th, 5 a.m.—Slight shock. 1.58 p.m.—Severe and long shock. Day fine.

April 27th, 5 a.m.—Slight shock; strong wind.

May 3rd, 9.50 a.m.—Sharp shock; squall came up with rain.

May 7th, 9.30.—Sharp shock, lasted several seconds; rained all day.

May 21st, 10.20. a.m.—Slight shock; day fine.

May 24th, 9.30. a.m.—Slight shock; day fine, overcast in afternoon, rain at night.

June 25th, 6.15 p.m.—Very severe and long shocks; day cloudy and cold, with wind.

July 16th, 10 a.m.—Slight shock.

July 30th, 10.5 a.m.—Very severe undulating shock; day fine, very warm.

August 5th.—Slight shock; day fine, very warm.

August 20th, 4.30 p.m.—Slight shock; heavy thunderstorm, with vivid lightning.

August 24th, at night.—Slight shock ; sultry, with rain.

August 27th, 2 a.m.—Slight shock, rained heavily. 9.10 p.m.—Slight shock, oscillating, lasted several seconds ; sultry and overcast.

September 14th, 5 p.m.—Sharp shock.

October 16th, 6.30 a.m.—Slight shock ; day fine and calm.

October 17th, 3 a.m.—Two severe shocks, and one slight one.

ART. XII.—*On the Probability that a Connexion of Causation will be shown to exist between the Attraction of Gravitation and the Molecular Energy of Matter.*

BY ALEXANDER SUTHERLAND, M.A.

[Read on the 13th Sept., 1877.]

IN his recent paper on "Force" Mr. Pirani asks what is meant when we say that one portion of matter attracts another. Is it to be supposed that just as a conscious being exerts a force upon an external object, so does one inanimate body exert a force upon another? To this notion he takes exception, and, as I conceive, with justice. For the idea that that which is itself devoid of energy should have the power of imparting energy to another body is opposed to all our intuitive beliefs.

Yet the fact remains, that when two bodies are placed in space at a distance from each other, and left to themselves, each begins to set the other in motion—that is, each imparts to the other a certain amount of kinetic energy.

Here we have a difficulty : on the one hand it is inconceivable that inanimate bodies should have the power of doing work, on the other there is every reason to believe that two portions of matter can do work upon one another. But in this connexion is not the word inanimate altogether misapplied? Now that we know all matter to be replete with energy, would it not be more correct to regard it as in certain respects animate? Seeing that it is possessed of energy, it must be possessed of the power of doing work, and if we could establish a connection between this internal molecular energy of matter and its power of doing